REMARKS

Reconsideration and allowance of the above-identified application are respectfully requested.

Claims 32-115 are currently pending, wherein claims 32, 41, 50, 51, 60, 69, 70, 99, 102, 102, 107, 110 and 112 are independent.

Claims 79-115 have been added. Support for the new claims can be found at least on page 18, line 9 to page 19, line 14 and Figure 5. No new matter has been introduced by way of these added claims.

Applicant notes with appreciation the acceptance by the Patent Office of the drawings filed on December 17, 1999, and August 15, 2000, subject to correction of the informalities regarding Figures 5 and 6 as indicated in the PTO-948 form accompanying the Office Action. Applicant hereby submits two (2) sheets of formal drawings for Figures 5 and 6 for review by the Patent Office in connection with the above-identified application. Should the enclosed drawings require changes, it is respectfully submitted that the Patent Office notify the undersigned of same.

Applicant notes with appreciation the acknowledgment by the Patent Office of the Information Disclosure Statement submitted in the present application.

Applicant would like to thank Examiner Singh and Supervisory Patent Examiner (SPE) Forester (Bill) Isen for the personal interview conducted on April 1, 2004. In compliance with M.P.E.P. § 713.04, the substance of that interview is incorporated in the foregoing amendments to the claims and in the following remarks.

During the interview, Examiner Singh and SPE Isen presented the Applicant with the following reference: Sen M. Kuo and Dennis R. Morgan, *Active Noise Control Systems:*

Algorithms and DSP Implementations, pages 35-38, 77-78 and 170 (John Wiley & Sons, Inc., 1996). [(hereinafter, "Kuo")] Applicant hereby encloses a PTO-1449 form listing Kuo and a copy of the Kuo reference for consideration by the Examiner.

During the interview, claim 32 was discussed with respect to Kuo and the references cited in the Office Action. No agreement was reached.

Exemplary embodiments of the present invention are directed to an apparatus for canceling near-end echo and near-end crosstalk in a receiver of a communication system having simultaneous transmission and receiving on a communication medium. The apparatus includes an adaptive correlator and a finite impulse response filter. The adaptive correlator is connected to a receiving circuit to acquire received signals from the communication medium. The adaptive correlator is also connected to at least one of a plurality of transmission channels of the communication system to acquire at least one transmitted signal from the adjacent transmission channels. The adaptive correlator generates a plurality of filter coefficients for reproducing the echo response of the received signals to near-end echo and near-end crosstalk interference from the transmitted signals at the arrival of each received signal. Each new filter coefficient is a weighted sum of a previous coefficient and a received signal multiplied by a time delayed version of a transmitted signal. More particularly, the previous coefficient is weighted by a first leakage factor, and the product of the received signal and the time-delayed transmitted signal is weighted by a second leakage factor.

The finite impulse filter is connected to the receiving circuit to acquire the received signals, and is connected to the adaptive correlator to receive the plurality of filter coefficients. The finite impulse filter reproduces the near-end echo and near-end crosstalk signals from the received signals based on the values of the plurality of filter coefficients.

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The reproduced near-end echo and near-end crosstalk signals are combined with the received

signals to cancel any echo and crosstalk interference from the received signals.

Kuo discloses a leaky LMS algorithm. [*See* Kuo, Equation 1, page 36] According to

the leaky LMS algorithm, each new filter coefficient is the sum of the previous coefficient

multiplied by a leakage factor and a product of an input signal, an error signal and a fixed

step size (μ). Kuo does not disclose or suggest the generation of a plurality of filter

coefficients for canceling near-end echo and near-end crosstalk, in which each new filter

coefficient is a weighted sum of a previous coefficient and one received signal multiplied by

a time delayed version of one transmitted signal. According to exemplary embodiments of

the present invention, the previous coefficient is weighted by a first leakage factor, and the

product of the received signal and the time-delayed transmitted signal is weighted by a

second leakage factor.

In the fifth section of the Office Action, claims 32, 51 and 70 are rejected under 35

U.S.C. § 102(b) as allegedly being anticipated by Hirano et al. (U.S. Patent No. 5,396,554,

hereinafter "Hirano"). This rejection is respectfully traversed.

Hirano discloses an echo canceling method and apparatus for subtracting, from a

mixed signal in which echoes produced from a plurality of reception signals are mixed with a

transmission signal, a replica of the echoes in order to cancel the echoes in the mixed signal.

The replica of the echoes are generated by the steps of selecting the reception signal which is

leading in phase and producing a replica of the echoes from the selected reception signal by

an adaptive filter. As shown in Equations 24 and 25, the coefficients of the adaptive filters

are updated according to a standard LMS algorithm, in which each new filter coefficient is

the sum of the previous coefficient and a product of an input signal, an error signal and a

fixed step size (μ). [*See* Hirano, column 10, lines 13-45]

However, the Patent Office notes that "[i]nherently, Hirano teaches an adaptation

algorithm. For example, Bonnet et al. (US 4,852,081) shows a typical form of an adaptation

algorithm . . . ." [Office Action, page 3] According to Bonnet, the filter coefficients are

updated according to Equation 4 or 5, which are standard LMS algorithms, in which each

new filter coefficient is the sum of the previous coefficient and a product of an input signal,

an error signal and a fixed step size (μ). [*See* Bonnet, column 2, lines 14-53]

It is respectfully submitted that Hirano does not disclose the generation of a plurality

of filter coefficients for canceling near-end echo and near-end crosstalk, in which each new

filter coefficient is a weighted sum of a previous coefficient and one received signal

multiplied by a time delayed version of one transmitted signal. According to exemplary

embodiments of the present invention, the previous coefficient is weighted by a first leakage

factor, and the product of the received signal and the time-delayed transmitted signal is

weighted by a second leakage factor. It is respectfully submitted that Hirano does not

anticipate the subject matter of claim 32.

Independent claims 51 and 70 recite features similar to those recited in independent

claim 32, and are, therefore, patentably distinguishable over Hirano for at least those reasons

state above with regard to claim 32.

For at least the foregoing reasons, it is respectfully submitted that the Hirano does not

anticipate the subject matter of claims 32, 51 and 70. Accordingly, reconsideration and

withdrawal of these grounds of rejection are respectfully requested.

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In the seventh section of the Office Action, claims 32, 38, 51, 57, 70 and 76 are

rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Traill et al. (U.S. Patent

No. 6,078,567, hereinafter "Traill"). This rejection is respectfully traversed.

Traill discloses an echo detecting system that includes data stores for storing signals

from up and down channels respectively. The signals undergo pre-processing to identify

signal forms characteristic of speech, and instruct a measurement unit to carry out

comparison using cross-correlation techniques between the signals stored in the stores only

when such characteristics are detected. More particularly, a transmitted is compared with a

reflected signal to calculate a cross-correlation coefficient. The transmitted signal is then

delayed by one unit of time and the cross-correlation coefficient re-calculated. When the

delayed transmit signal and the reflected signal are equal, the cross-correlation coefficient

will be approximately unity. [See Traill, column 6, lines 1-18] An echo cancellation signal is

generated using the cross-correlation measurement by "canceller 7 or 17 by extracting the

input signal from buffer 8 or 18 respectively, attenuating and delaying it by amounts

equivalent to the detected echo signal as measured in unit 12 and applying to the return path

15 or 5 respectively a signal corresponding to the result of this process but out of phase with

the detected signal by 180°. This applied signal is combined in combiners 13, 14 respectively

with the echo arriving on the return path 5 or 15 to produce a zero output." [Traill, column 6,

line 60 – column 7, line 3]

However, the Patent Office notes that "[i]nherently, Traill et al teaches an adaptation

algorithm. For example, Bonnet et al. (US 4,852,081) shows a typical form of an adaptation

algorithm . . . ." [Office Action, page 3] As discussed previously, according to Bonnet, the

filter coefficients are updated according to Equation 4 or 5, which are standard LMS

algorithms, in which each new filter coefficient is the sum of the previous coefficient and a product of an input signal, an error signal and a fixed step size (μ). [*See* Bonnet, column 2, lines 14-53]

In addition, the Patent Office notes that Traill refers to Taguchi (U.S. Patent No. 5,062,102). Taguchi discloses a data transmission system in which a first signal partially leaks as an echo from a first transmission line to a second transmission line through a hybrid circuit to form a mixed signal of the echo and a second signal on the second transmission line. An echo canceller is used for canceling the echo by producing an echo replica at a transversal filter according to filter coefficients and subtracting the echo replica from the mixed signal. [*See* Taguchi, Abstract] The filter coefficients are determined according to Equation 5, which is a linear prediction algorithm. [*See* Taguchi, column 5, line 67 – column 6, line 47]

It is respectfully submitted Traill does not disclose the generation of a plurality of filter coefficients for canceling near-end echo and near-end crosstalk, in which each new filter coefficient is a weighted sum of a previous coefficient and one received signal multiplied by a time delayed version of one transmitted signal. According to exemplary embodiments of the present invention, the previous coefficient is weighted by a first leakage factor, and the product of the received signal and the time-delayed transmitted signal is weighted by a second leakage factor. It is respectfully submitted that Traill does not anticipate the subject matter of claim 32.

Independent claims 51 and 70 recite features similar to those recited in independent claim 32, and are, therefore, patentably distinguishable over Traill for at least those reasons state above with regard to claim 1.

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Claims 38, 57, and 76 variously depend from allowable claims 32, 51 and 70, and are, therefore, also allowable for least those reasons stated above with regard to claims 32, 51 and 70.

For at least the foregoing reasons, it is respectfully submitted that the Traill does not anticipate the subject matter of claims 32, 38, 51, 57, 70 and 76. Accordingly, reconsideration and withdrawal of these grounds of rejection are respectfully requested.

In the ninth section of the Office Action, claims 41, 50, 60 and 69 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Hatamian (U.S. Patent No. 6,272,173) in view of either Hirano or Traill. This rejection is respectfully traversed.

Hatamian discloses a method for reducing a propagation delay of a digital filter. The digital filter has an input path and an output path and includes a set of delay elements and a number of taps. The taps couples the input path to the output path. Each of the taps includes a coefficient, a multiplier and an adder. According to Hatamian, "[d]uring each adaptation process, the values of the coefficients C_i are trained using *a well-known least-mean-squares algorithm* by an adaptation circuitry (not shown in FIG. 3A). After training, the coefficients C_i converge to stable values." [Hatamian, column 7, lines 8-11 (emphasis added)] Thus, Hatamian discloses a standard LMS algorithm, in which each new filter coefficient is the sum of the previous coefficient and a product of an input signal, an error signal and a fixed step size (μ).

It is respectfully submitted that Hatamian does not disclose or suggest the generation of a plurality of filter coefficients for canceling near-end echo and near-end crosstalk, in which each new filter coefficient is a weighted sum of a previous coefficient and one received signal multiplied by a time delayed version of one transmitted signal. According to

exemplary embodiments of the present invention, the previous coefficient is weighted by a first leakage factor, and the product of the received signal and the time-delayed transmitted signal is weighted by a second leakage factor.

For at least those reasons discussed above, it is respectfully submitted that Hirano and Traill do not address the above-identified deficiencies of Hatamian. Consequently, it is respectfully submitted that the combination of Hatamian and either Hirano or Traill does not render the subject matter of claim 41 obvious.

According to M.P.E.P. § 2143, to establish a prima facie case of obviousness, three basic criteria must be met. "First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings." [M.P.E.P. § 2143] In other words, "[o]bviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art." [M.P.E.P. § 2143.01]

It is respectfully submitted that neither Hatamian nor Hirano nor Trail, whether considered individually or in combination, disclose or suggest the generation of a plurality of filter coefficients for canceling near-end echo and near-end crosstalk, in which each new filter coefficient is a weighted sum of a previous coefficient and one received signal multiplied by a time delayed version of one transmitted signal. Consequently, it is respectfully submitted that the Patent Office has not demonstrated some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the reference of Hatamian with either Hirano or Traill..

It is respectfully submitted that no support exists for combining Hatamian with either Hirano or Traill. For example, since the combination of Hatamian with either Hirano or Traill does not disclose or suggest features of claim 41, it is respectfully submitted that there is no teaching, suggestion or motivation, either explicitly or implicitly, to combine the references. Consequently, it is respectfully submitted that the Patent Office has not established a prima facie case of obviousness.

Furthermore, according to M.P.E.P. § 2142, "[t]o reach a proper determination under 35 U.S.C. 103, . . . impermissible hindsight must be avoided and the legal conclusion [of obviousness] must be reached on the basis of the facts gleaned from the prior art." Furthermore, according to M.P.E.P. § 2143.01, "[t]he mere fact that references can be . . . modified does not render the resultant combination obvious unless the prior art also suggests the desirability of [such modification]." [citing *In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990)] Since the Patent Office has not pointed out where Hirano or Traill discloses or suggests the features not disclosed or suggested by Hatamian, and has offered no proper support or motivation for combining these references, it is respectfully submitted that the rejection based on obviousness is founded upon "knowledge gleaned only from applicant's disclosure." [*see* M.P.E.P. § 2145] Consequently, it is respectfully submitted that the rejection entails hindsight and is, therefore, improper.

Independent claims 50, 60 and 69 recite features similar to those recited in independent claim 41, and are, therefore, patentably distinguishable over the combination of Hatamian and either Hirano or Traill for at least those reasons state above with regard to claim 41.

Regarding the rejection of claims 50 and 69, the Patent Office asserts that "[t]hese two hybrid transceivers are inherently present in Hatamian. For example, Azadet et al [U.S. Patent No. 6,584,159] shows first hybrid transceiver 100 and second transceiver 120 [Fig 1]." [Office Action, page 9] However, it is respectfully noted that Azadet discloses that "[t]he tap weights for the crosstalk cancellation are illustratively obtained using *a modified version of the least mean square (LMS) algorithm* for discrete time signals. [C]omputational gains are achieved using a correlation multiplier that quantizes $e(t)$ and $x_k(t)$ with only one or two bits." [Azadet, Abstract]

For at least the foregoing reasons, it is respectfully submitted that the combination of Hatamian and either Hirano or Traill does not render the subject matter of claims 41, 50, 60 and 69 obvious. Accordingly, reconsideration and withdrawal of these grounds of rejection are respectfully requested.

In the tenth section of the Office Action, claims 33-37, 39-40, 52-56, 58-59, 71-75 and 77-78 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Traill in view of Virdee (U.S. Patent No. 5,473,686). This rejection is respectfully traversed.

Claims 33-37, 39-40, 52-56, 58-59, 71-75 and 77-78 variously depend from claims 32, 51 and 70 and are, therefore, patentably distinguishable over the combination of Traill and Virdee for at least those reasons stated above with regard to claims 32, 51 and 70. For example, it is respectfully submitted that Virdee does not disclose or suggest the generation of a plurality of filter coefficients for canceling near-end echo and near-end crosstalk, in which each new filter coefficient is a weighted sum of a previous coefficient and one received signal multiplied by a time delayed version of one transmitted signal.

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With regard to the rejection of claim 36, the Patent Office directs the attention of the Applicant to Chevreau et al (U.S. Patent No. 4,571,720, hereinafter "Chevreau") as an example of the normalization of a cross-correlation term. However, it is respectfully submitted that Chevreau discloses that the coefficients of a transversal filter are updated according to an equation comprising the sum of the initial coefficients and a product of a difference signal, the complex conjugate value of the last N data entering the transversal filter, and a constant proportional to the inverse of the power of each of the transmitted data. [*See* Chevreau, Abstract and column 4, lines 8-26] If the initial coefficients are set to zero, the received signal can be substituted for the difference signal. [*See* Chevreau, column 4, lines 27-31]

Accordingly, reconsideration and withdrawal of these grounds of rejection are respectfully requested.
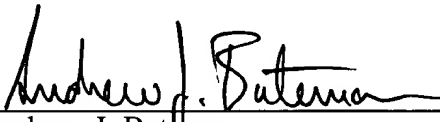
In the eleventh section of the Office Action, claims 42-49 and 61-68 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Hatamian and Traill in view of Virdee. This rejection is respectfully traversed.

Claims 42-49 and 61-68 variously depend from claims 41 and 60 and are, therefore, patentably distinguishable over the combination of Hatamian, Traill and Virdee for at least those reasons stated above with regard to claims 41 and 60. Accordingly, reconsideration and withdrawal of these grounds of rejection are respectfully requested.

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All of the rejections raised in the Office Action having been addressed, it is

respectfully submitted that the present application is in condition for allowance and a notice

to that effect is earnestly solicited. Should the Examiner have any questions regarding this

response or the application in general, the Examiner is urged to contact the Applicant's

attorney, Andrew J. Bateman, by telephone at (202) 625-3547. All correspondence should

continue to be directed to the address given below.

Respectfully submitted,

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